

PCT

WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau



INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : B32B 5/18, 15/04, E04C 2/26</p>	<p>A1</p>	<p>(11) International Publication Number: WO 97/11843 (43) International Publication Date: 3 April 1997 (03.04.97)</p>
<p>(21) International Application Number: PCT/NO96/00229 (22) International Filing Date: 27 September 1996 (27.09.96) (30) Priority Data: 953858 29 September 1995 (29.09.95) NO (71) Applicant (for all designated States except US): NORSK HYDRO ASA [NO/NO]; N-0240 Oslo (NO). (72) Inventors; and (75) Inventors/Applicants (for US only): WATHNE, Einar [NO/NO]; Hvalstadåsen 29, N-1364 Hvalstad (NO). THRANE-NIELSEN, Haakon [NO/NO]; N-9780 Lebesby (NO). (74) Agent: RICANEK, Ivan; Norsk Hydro ASA, N-0240 Oslo (NO).</p>		<p>(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, US, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published With international search report.</p>
<p>(54) Title: BUILDING ELEMENT</p> <div data-bbox="506 1220 1218 1589"></div> <p>(57) Abstract</p> <p>A building laminate comprises a supporting plate (2) of foam-aluminium joined together with a surface layer (3) by means of an adhesive having an optimal adhesion to both components. The supporting plate may be provided with a tube sling (5) for the cooling/heating of the surface layer (3).</p>		

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	GB	United Kingdom	MW	Malawi
AT	Austria	GE	Georgia	MX	Mexico
AU	Australia	GN	Guinea	NE	Niger
BB	Barbados	GR	Greece	NL	Netherlands
BE	Belgium	HU	Hungary	NO	Norway
BF	Burkina Faso	IE	Ireland	NZ	New Zealand
BG	Bulgaria	IT	Italy	PL	Poland
BJ	Benin	JP	Japan	PT	Portugal
BR	Brazil	KE	Kenya	RO	Romania
BY	Belarus	KG	Kyrgyzstan	RU	Russian Federation
CA	Canada	KP	Democratic People's Republic of Korea	SD	Sudan
CF	Central African Republic	KR	Republic of Korea	SE	Sweden
CG	Congo	KZ	Kazakhstan	SG	Singapore
CH	Switzerland	LI	Liechtenstein	SI	Slovenia
CI	Côte d'Ivoire	LK	Sri Lanka	SK	Slovakia
CM	Cameroon	LR	Liberia	SN	Senegal
CN	China	LT	Lithuania	SZ	Swaziland
CS	Czechoslovakia	LU	Luxembourg	TD	Chad
CZ	Czech Republic	LV	Latvia	TG	Togo
DE	Germany	MC	Monaco	TJ	Tajikistan
DK	Denmark	MD	Republic of Moldova	TT	Trinidad and Tobago
EE	Estonia	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	UG	Uganda
FI	Finland	MN	Mongolia	US	United States of America
FR	France	MR	Mauritania	UZ	Uzbekistan
GA	Gabon			VN	Viet Nam

Building element

The present invention relates to a composed wallboard (a laminate) and more specifically to a facade/floor board.

Large modern buildings as office buildings and public buildings as museums, theatres etc. often are provided with boards both at the inside and the outside thereof, the boards having for instance specular/reflective properties, decorative stones/slabs etc. The selection of materials, a relatively high weight/volume and labour-consuming production/assembling accompanied by high costs, will represent an obvious limitation for a broader implementation of such boards also in other types of buildings.

It is therefore an object of the present invention to provide a new type of laminate that is substantially lighter than the previously known/applied boards, the laminate being more simple to produce and to assemble.

Another object of the invention is to provide a facade board having an attractive, colour stable appearance that will not deteriorate even under extreme climatic conditions with intensive sun radiation in tropical/subtropical areas.

A further object of the invention is to provide a laminate having a built-in tube system for the circulation of a medium to achieve an effective cooling/heating of the surface of the laminate.

These and other objects and characteristic features of the invention and its preferred embodiments are achieved by a laminate as described in the claims and the detailed description of the invention with reference to the Figures 1-2, where

Fig. 1 shows schematically in an vertical cross-section the construction of the laminate, and

Fig. 2 illustrates the laminate in a horizontal section along the line I-I in Fig. 1.

Fig. 1 illustrates schematically the laminate 1, comprising a supporting plate 2 joined to a thinner top layer 3 by means of for instance a thin layer of adhesive (not shown in the figure). The supporting plate 2 is according to a preferred embodiment of the invention made from foam-aluminium, preferably reinforced by non-metallic (ceramic) particles, of the type described in Norwegian Patent No. 172 697. Characteristic features of this type of foam-aluminium is that it has good mechanical properties and low weight (up to 90 % reduction in weight compared to matrix Al-material) together with good insulation properties regarding both thermal and acoustic insulation.

Fig. 2 illustrates a preferred embodiment of the laminate, where the supporting plate 2 is further provided with a plurality of grooves/recesses, arranged substantially parallel to each other, for the installation of a tube system shown in the Figure as tube sling 5. The tubes form part of a circulation system (not shown in the Figure) for cooling or heating of the top layer 3 when required, depending on the application of the laminate. Cooling/heating medium may circulate serially as shown in the Figure or in a parallel manner, respectively. The tubes, tube connections and the support/mounting of the supporting plate to a possible suspension frame are made from a compatible Al-material (alloy), to eliminate the problems related to galvanic corrosion.

Another preferred embodiment of the laminate according to the invention comprises a top layer 3 made from a thin split natural slate, for instance a black surface-centered Finnmark-slate joined to foam-aluminium by adhesive means. According to this embodiment there is provided a novel type of facade boards having special/unique properties. The commercially applied specular glass areas will become polluted both outside and inside, and there will gradually develop a deposit at the underside thereof caused by a corroded deposit in the solar heat collector. This influences the appearance in a negative manner, with fading, tinting colours and heat transfer properties, leading to a vast reduction in the heat absorption even as early as 5-7 years after installation. The novel material provides a maintenance-free, colour stable solar heat collector with low weight due to the thickness of the applied slate plates. The thickness of said plates may be in the range of 1.5-2.5 mm. The total weight per square metres of the laminate will be about 22 kilos dependent on the thickness of the slates and the thickness of the supporting foam-aluminium (20-40 mm), a feature which is very advantageous with respect to transport and when performing assembling at the building site. The facade boards may be handled by manual operations and thus special crane equipment will not be required. The black, surface-centered slate surface with bounded graphite is totally waterproof, colour stable and has high tensile strength values.

Long run tests conducted on this material show that the material will neither fade nor foul, even when exposed to corrosive environments for 50 years. The laminate may be manufactured according to desired standard sizes as (conventional) two-component adhesive systems are applied in joining together the slate plates and the foam-aluminium preceded by possible priming of the contact surface of the slate.

A further advantage of using foam-aluminium as supporting plate material is that the material is easy to process, and the pattern of grooves for the installation of tubes may even be stamped/pressed into the plate material as an alternative to milling, thus obtaining a process that saves material and that is benign with respect to the environment.

The laminate boards may, in addition to the application as facade boards, be applied as wall elements that are free-standing or integrated in roof or floor constructions with or without a built-in tube system for heat absorption and/or heat emission (cooling).

Claims

1. A laminate (1) comprising a supporting plate (2) joined together with a surface layer (3),
characterised in that
the supporting plate (2) is made from foam-aluminium.
2. Laminate according to claim 1,
characterised in that
the supporting plate is provided with a plurality of substantially parallel grooves for the assembling of a tube sling (5), for the cooling/heating of the surface layer (3).
3. Laminate according to claim 1 or 2,
characterised in that
the surface layer (3) comprises thin split natural slates fixed to the supporting plate (2) by means of an adhesive having an optimal adhesion to both natural slate and foam-aluminium.
4. Laminate according to claim 3,
characterised in that
the thickness of the slate layer is 1 to 3 mm.
5. Laminate according to one or more of the foregoing claims,
characterised in that
the laminate is applied as a facade board.

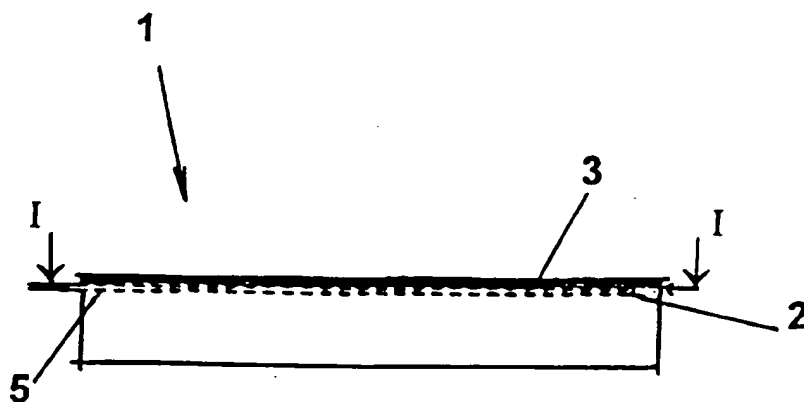


Fig. 1

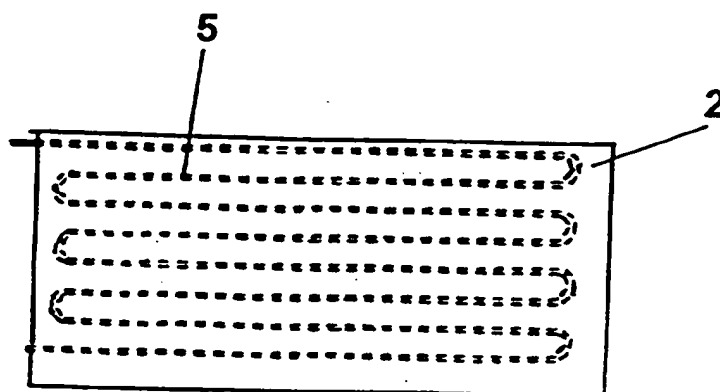


Fig. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/NO 96/00229

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: B32B 5/18, B32B 15/04, E04C 2/26

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: B32B, C22C, E04C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0210803 A1 (DIRECTOR-GENERAL OF THE AGENCY OF INDUSTRIAL SCIENCE AND TECHNOLOGY ET AL), 4 February 1987 (04.02.87), abstract, example 5 --	1-5
A	WO 9101387 A1 (NORSK HYDRO A.S.), 7 February 1991 (07.02.91) --	1-5
A	DE 2814004 A1 (WOERMANN, BAUCHEMIE-HOLDING AG), 11 October 1979 (11.10.79), figure 1 --	2
A	WO 9105929 A1 (OWENS, CHARLES, R.), 2 May 1991 (02.05.91), page 10, line 30 - line 33, abstract --	3

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

19 December 1996

Date of mailing of the international search report

16 -01- 1997

Name and mailing address of the ISA/

Swedish Patent Office

Box 5055, S-102 42 STOCKHOLM

Facsimile No. +46 8 666 02 86

Authorized officer

Jack Hedlund

Telephone No. +46 8 782 25 00

INTERNATIONAL SEARCH REPORT

Information on patent family members

28/10/96

International application No.

PCT/NO 96/00229

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0210803	04/02/87	CA-A- 1267550	10/04/90
		JP-A- 62171916	28/07/87
		US-A- 4713277	15/12/87
		JP-B- 1051528	06/11/89
		JP-C- 1566284	25/06/90
		JP-A- 62020846	29/01/87
		JP-C- 1616214	30/08/91
		JP-B- 2040239	10/09/90
		JP-A- 62152199	07/07/87
WO-A1- 9101387	07/02/91	CA-A- 2064099	18/01/91
		DE-D,T- 69006359	11/05/94
		EP-A,B- 0483184	06/05/92
		SE-T3- 0483184	
		ES-T- 2049037	01/04/94
		HU-B- 210524	28/04/95
		JP-T- 4506835	26/11/92
		RU-C- 2046151	20/10/95
DE-A1- 2814004	11/10/79	NONE	
WO-A1- 9105929	02/05/91	AU-A- 6726890	16/05/91
		EP-A- 0496826	05/08/92
		US-A- 5208086	04/05/93
		US-A- 5314554	24/05/94